

CLAIMS

1. A semiconductor device which has a synthetic high-molecular compound, with which a semiconductor element and at least part of electrical connecting means used for electrically connecting the semiconductor device to external devices are covered, in which

the synthetic high-molecular compound contains a compound having a three-dimensional steric structure which is formed by linking plural third organosilicon polymers, which have been formed by linking at least one first organosilicon polymers having a crosslinked structure using siloxane (Si-O-Si combination) with at least one second organosilicon polymers having a linear linked structure using siloxane through siloxane bonds, with covalent bonds resulting from addition reaction.

2. The semiconductor device as claimed in claim 1, in which the synthetic high-molecular compound contains a compound having a three-dimensional steric structure which is formed by linking plural third organosilicon polymers, which have been formed by alternately and linearly linking a first organosilicon polymer having a crosslinked structure using siloxane with a second organosilicon polymer having a linear linked structure using siloxane through a siloxane bond, with covalent bonds resulting from addition reaction.

3. The semiconductor device as claimed in claim 1, in

which

the semiconductor element is either a SiC semiconductor element using a wide gap semiconductor or a GaN semiconductor element using a wide gap semiconductor,

the first organosilicon polymer is at least one selected from the group consisting of polyphenylsilsesquioxane, polymethylsilsesquioxane, polyethylsilsesquioxane, and polypropylsilsesquioxane, and

the second organosilicon polymer is at least one selected from the group consisting of polydimethylsiloxane, polydiethylsiloxane, polydiphenylsiloxane, and polymethylphenylsiloxane.

4. The semiconductor device as claimed in claim 1, in which

the semiconductor element is a wide gap semiconductor light-receiving element, a wide gap semiconductor light-emitting element, or a combination thereof,

the first organosilicon polymer is at least one selected from the group consisting of polyphenylsilsesquioxane, polymethylsilsesquioxane, polyethylsilsesquioxane, and polypropylsilsesquioxane, and

the second organosilicon polymer is at least one selected from the group consisting of polydimethylsiloxane, polydiethylsiloxane, polydiphenylsiloxane, and polymethylphenylsiloxane.

5. A semiconductor device comprising:

at least one semiconductor elements mounted on a substrate having favorable thermal conductivity;

electrical connecting portions for electrically connecting the semiconductor elements to external devices;

a first synthetic high-molecular compound with which the semiconductor elements and at least part of the electrical connecting portions are covered and which contains a compound having a three-dimensional steric structure which is formed by linking plural third organosilicon polymers, which have been formed by linking at least one first organosilicon polymers having a crosslinked structure using siloxane (Si-O-Si combination) with at least one second organosilicon polymers having a linear linked structure using siloxane through siloxane bonds, with covalent bonds resulting from addition reaction;

a case of a hard resin provided on the substrate so as to house the semiconductor elements and the electrical connecting portions covered with the synthetic high-molecular compound;

a second synthetic high-molecular compound with which a space within the case are filled and which mainly comprises polyphenylsilsesquioxane and polydimethylsiloxane; and

external connecting terminals which are connected to the electrical connecting portions and which lead outside the case.

6. The semiconductor device as claimed in claim 5, in which the first synthetic high-molecular compound contains a compound having a three-dimensional steric structure which is formed by linking plural third organosilicon polymers, which have been formed by alternately and linearly linking a first organosilicon polymer having a crosslinked structure using siloxane with a second organosilicon polymer having a linear linked structure using siloxane through a siloxane bond, with covalent bonds resulting from additional reaction.

7. The semiconductor device as claimed in claim 5, in which

the semiconductor elements are either SiC semiconductor elements using wide gap semiconductors or GaN semiconductor elements using wide gap semiconductors,

the first organosilicon polymer is at least one selected from the group consisting of polyphenylsilsesquioxane, polymethylsilsesquioxane, polyethylsilsesquioxane, and polypropylsilsesquioxane, and

the second organosilicon polymer is at least one selected from the group consisting of polydimethylsiloxane, polydiethylsiloxane, polydiphenylsiloxane, and polymethylphenylsiloxane.

8. The semiconductor device as claimed in claim 5, in which the semiconductor elements are a SiC-GTO element and a SiC diode element and are connected in reversely parallel with

each other by the electrical connecting portions within the case.